

Exploring the Mawrth Vallis Stratigraphy South of 20° N

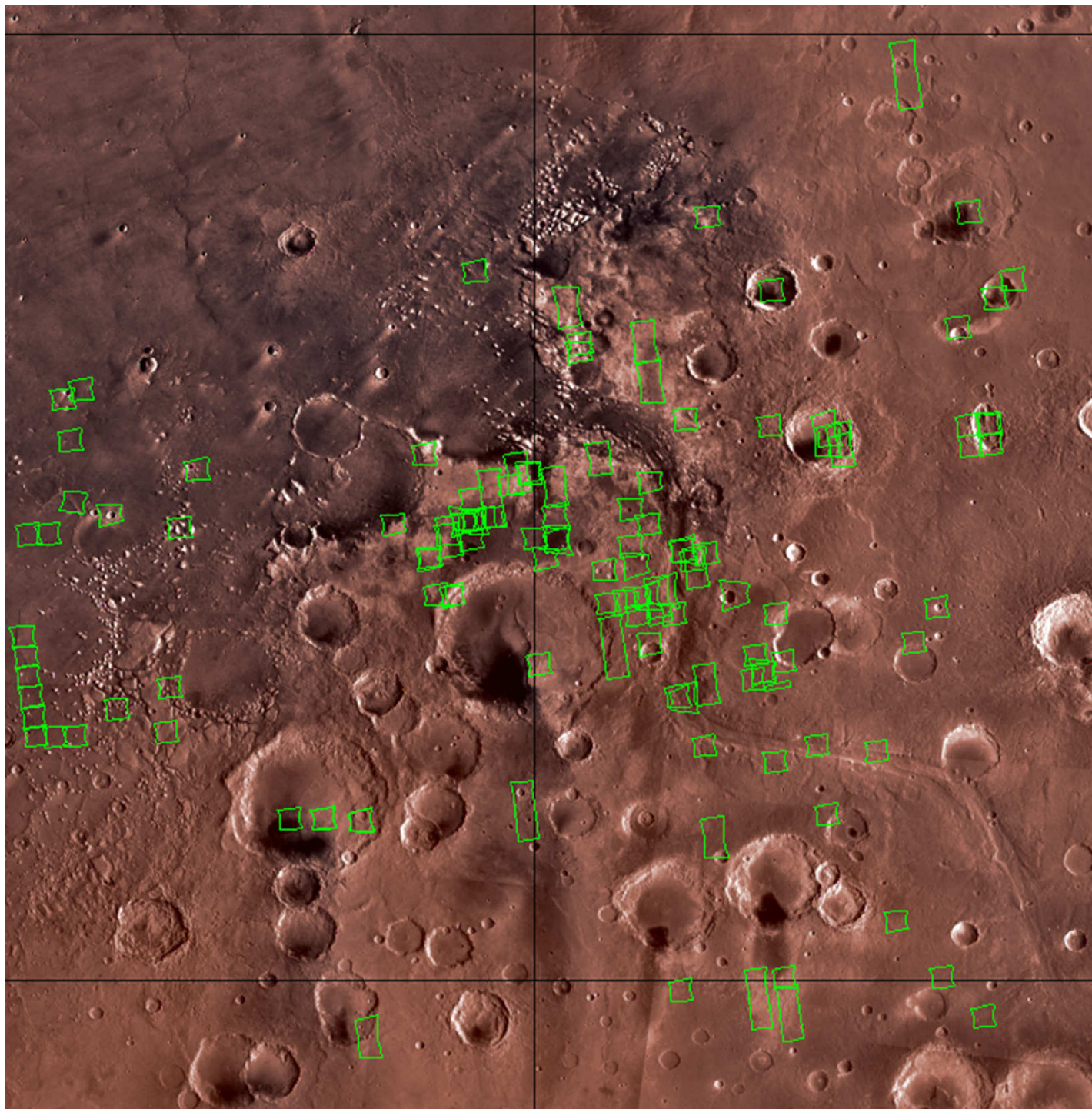
Bill Farrand, Jim Rice, and Eldar
Noe Dobrea

Wednesday, February 29, 2012

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Introduction

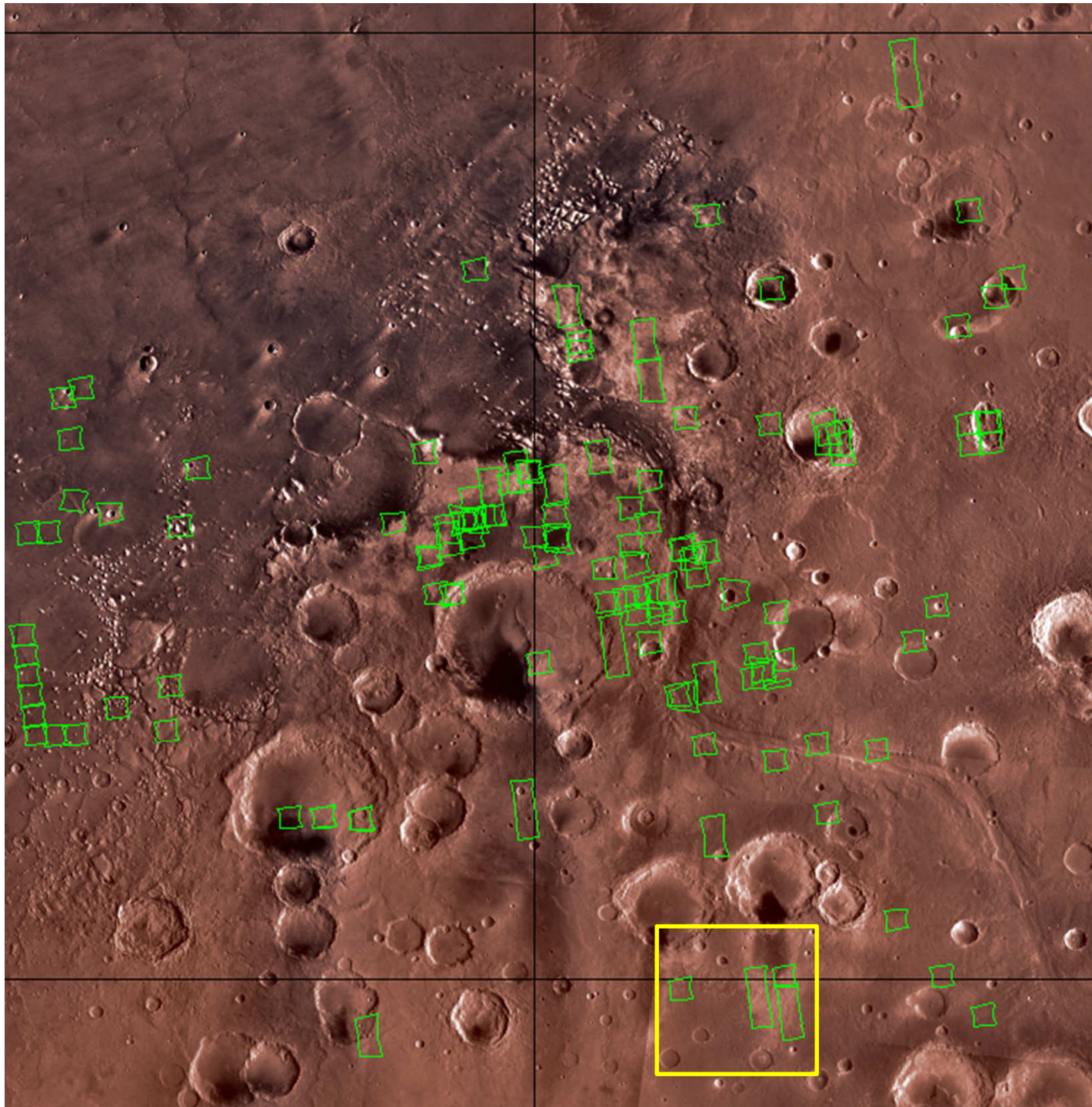
- The Mawrth Vallis Region was one of the “Final Four” candidates for a MSL landing site
- It is noteworthy for
 - its age: Noachian
 - Exposure
 - Mineralogic diversity, occurrences of:
 - Fe/Mg smectites
 - Al smectites
 - Kaolinite group minerals
 - Hydrated silica
 - Ferrous mica or chlorite
 - Sulfates
- But...



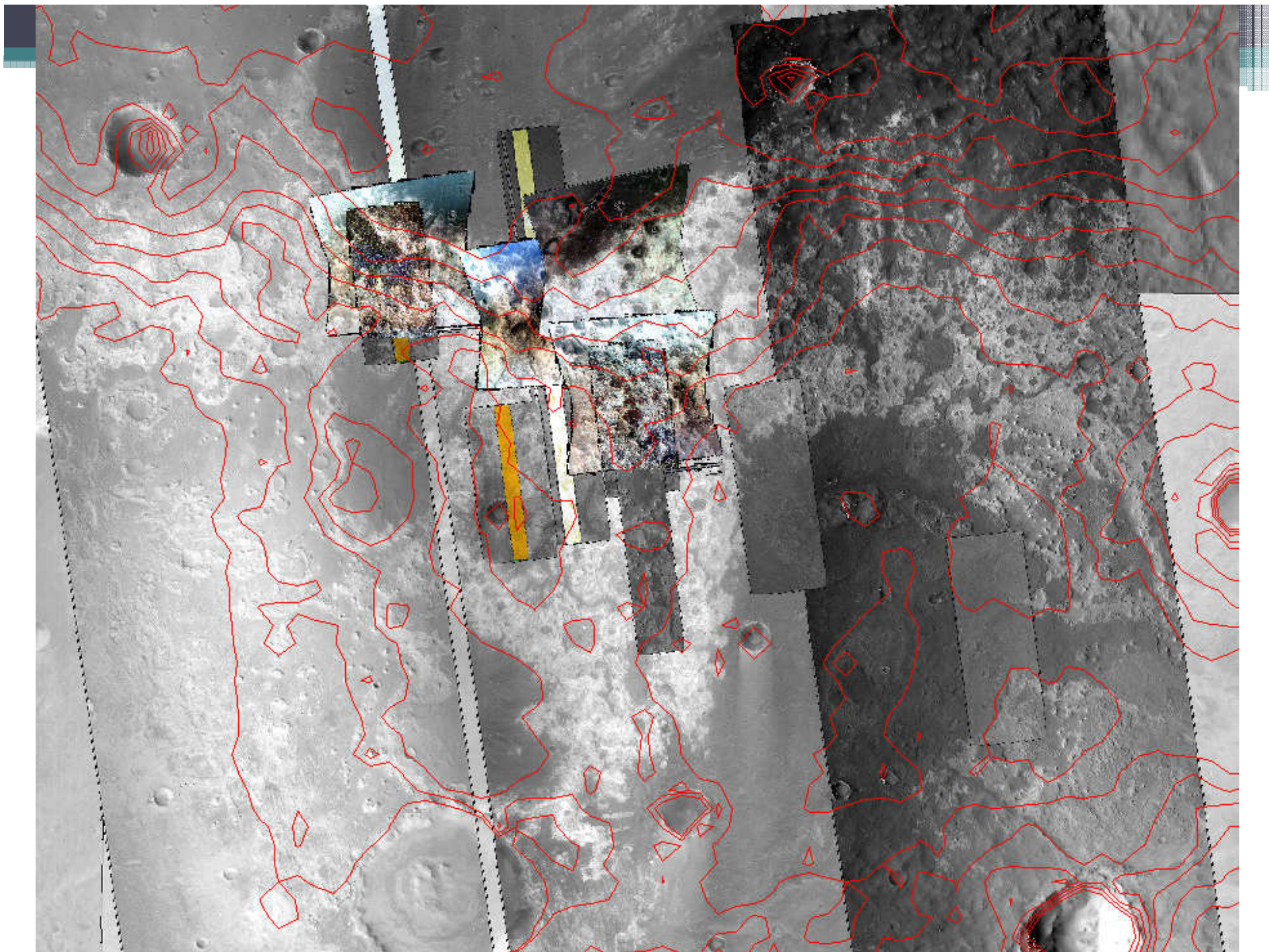
20°N

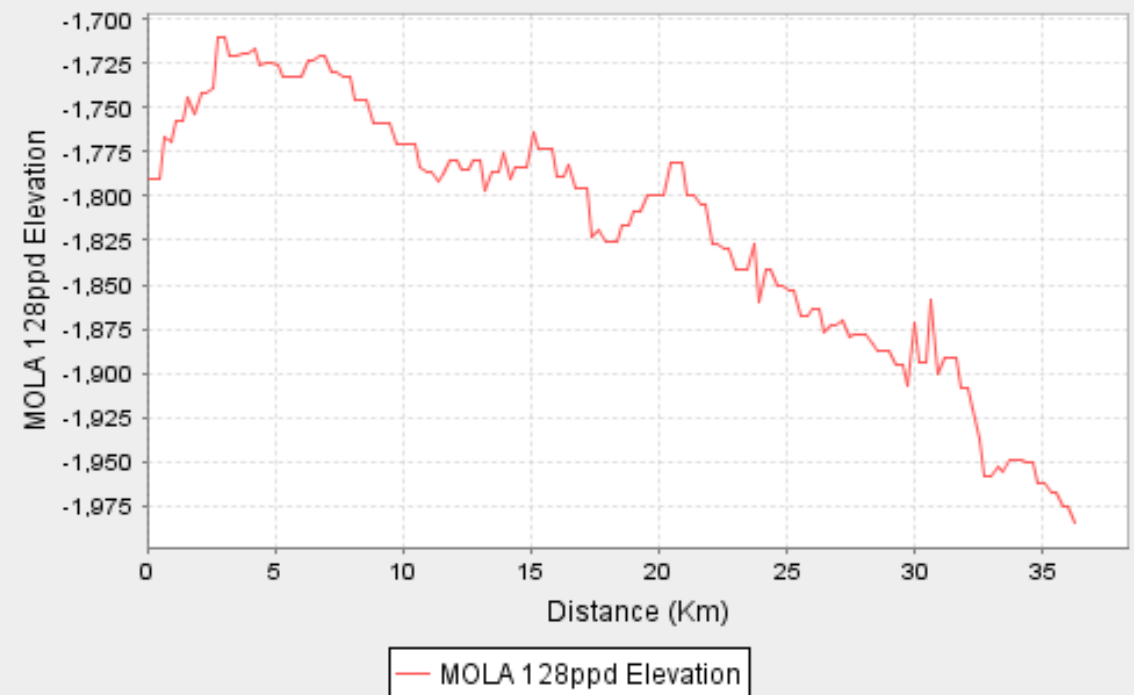
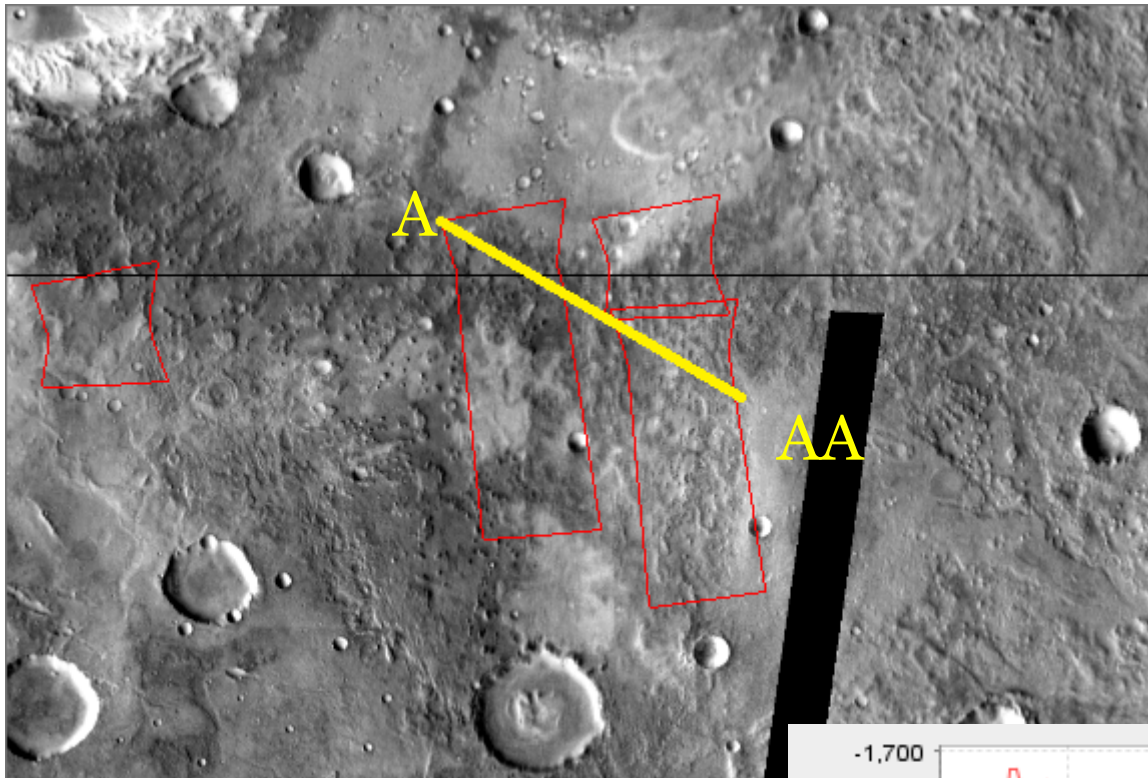
LATITUDE Challenges

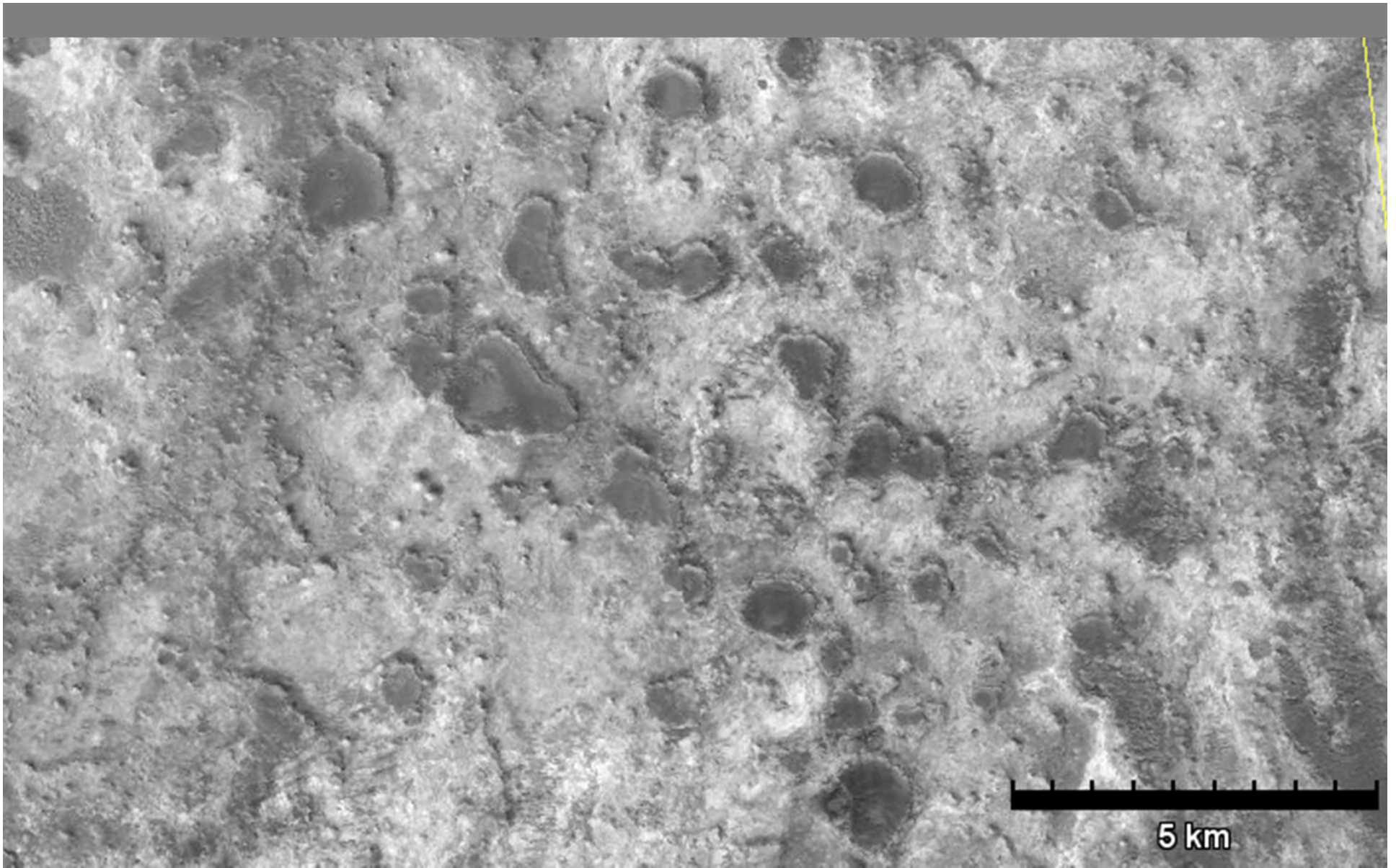
- From the 2010 report of the MRR-SAG:
- “Latitude access for a solar-powered rover with a minimum of a 1-Earth-year primary mission lifetime is restricted to between 25°N and 15°S”
- Experience with Spirit, near 15°S, has shown the challenges of pushing the limits of solar-powered rovers
 - Need to winter-over on an equator-facing slope



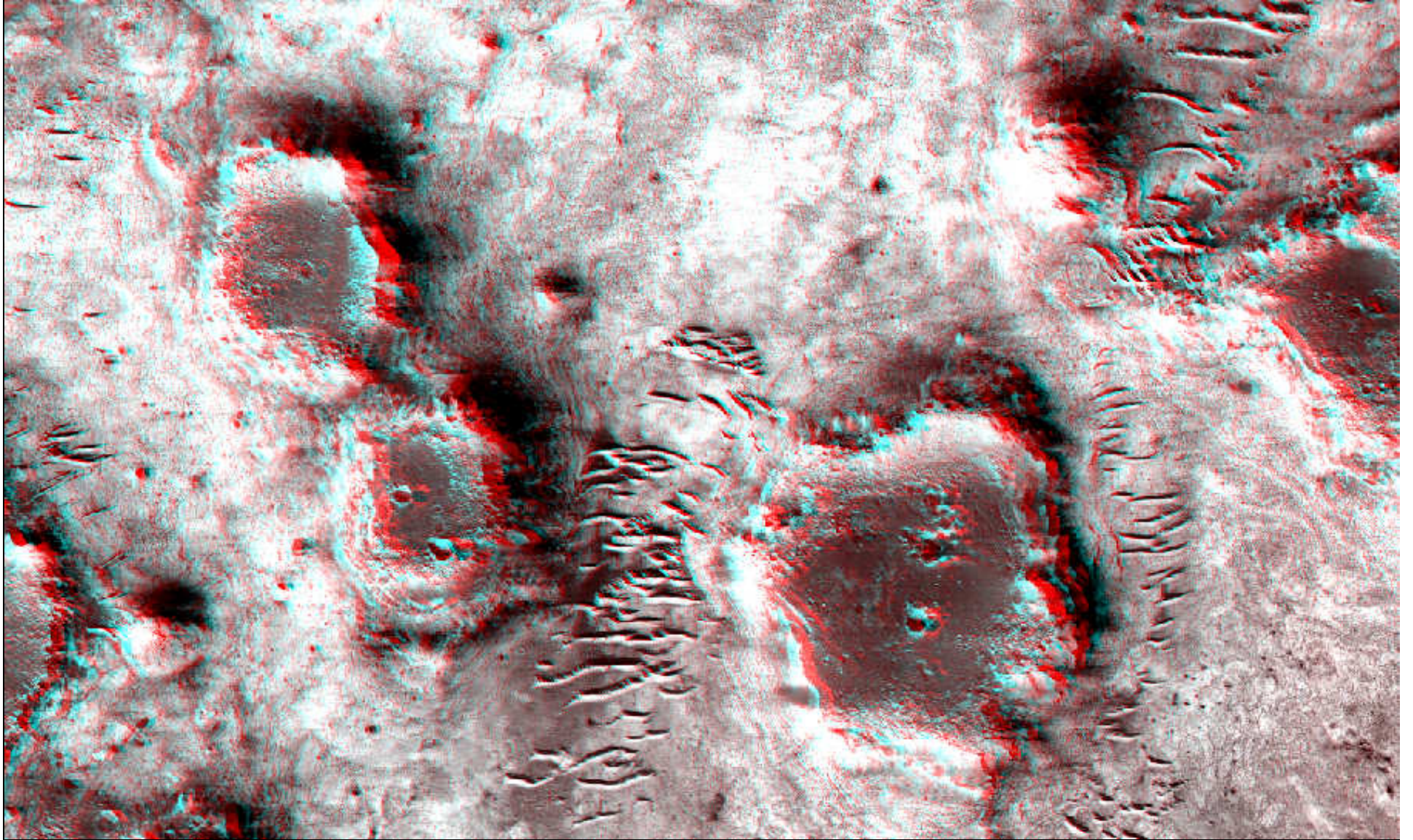
20°N

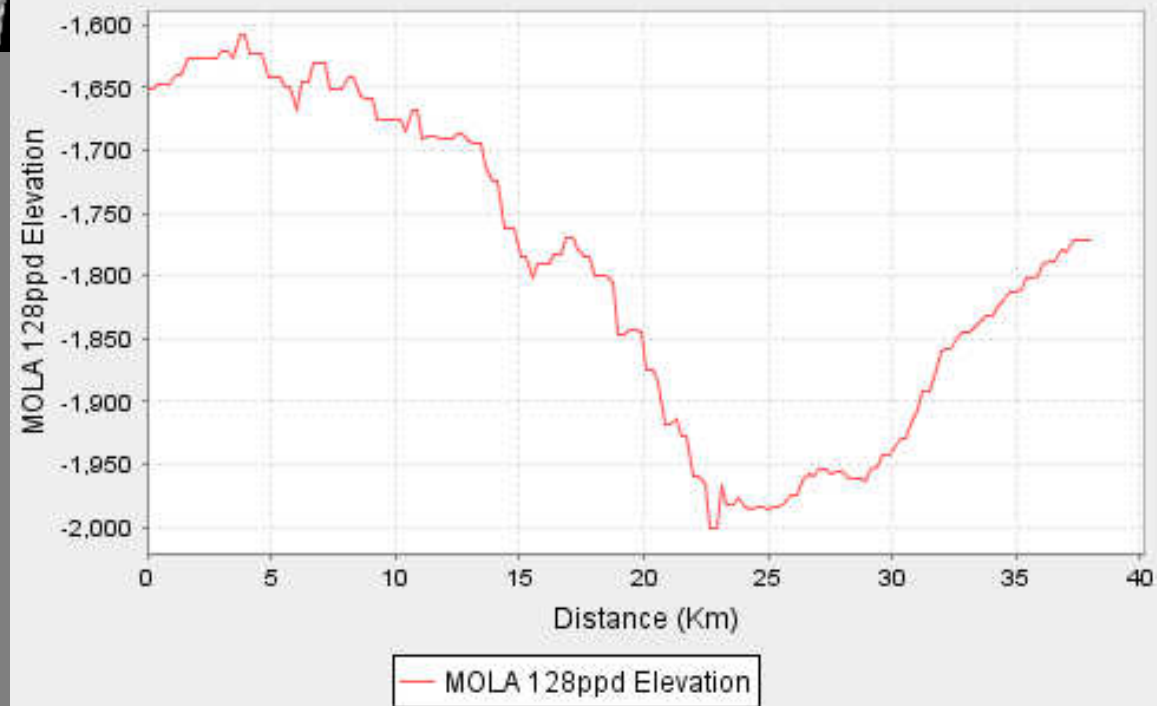
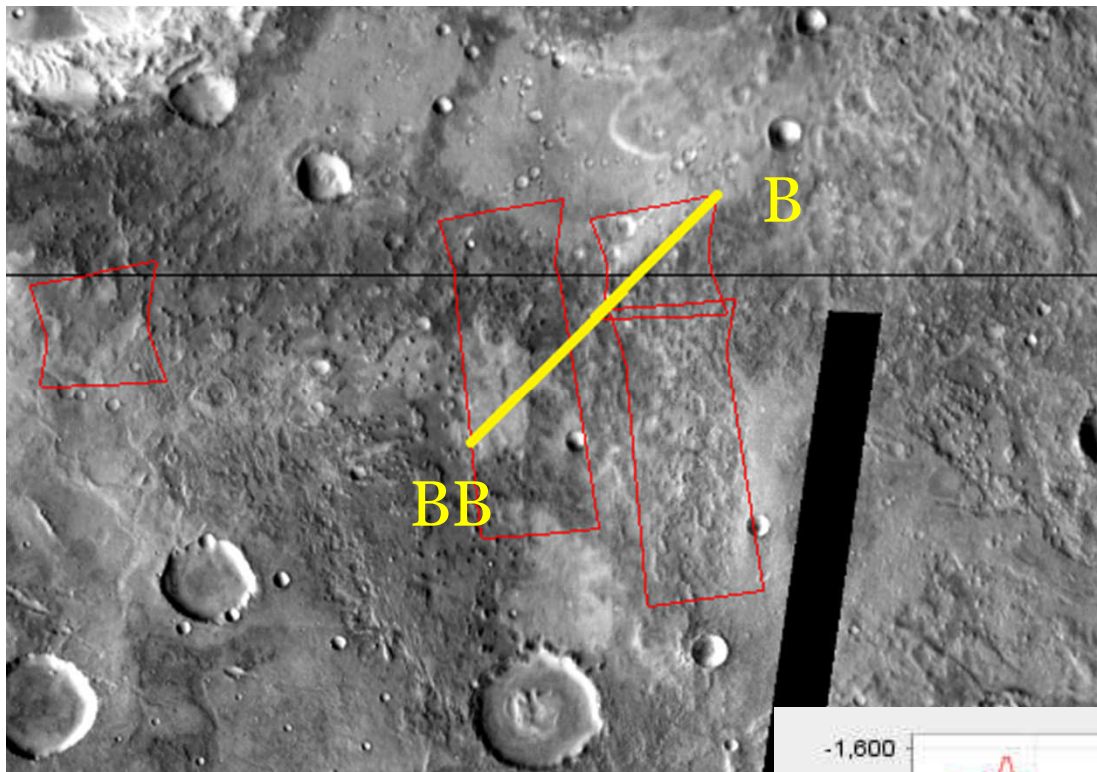


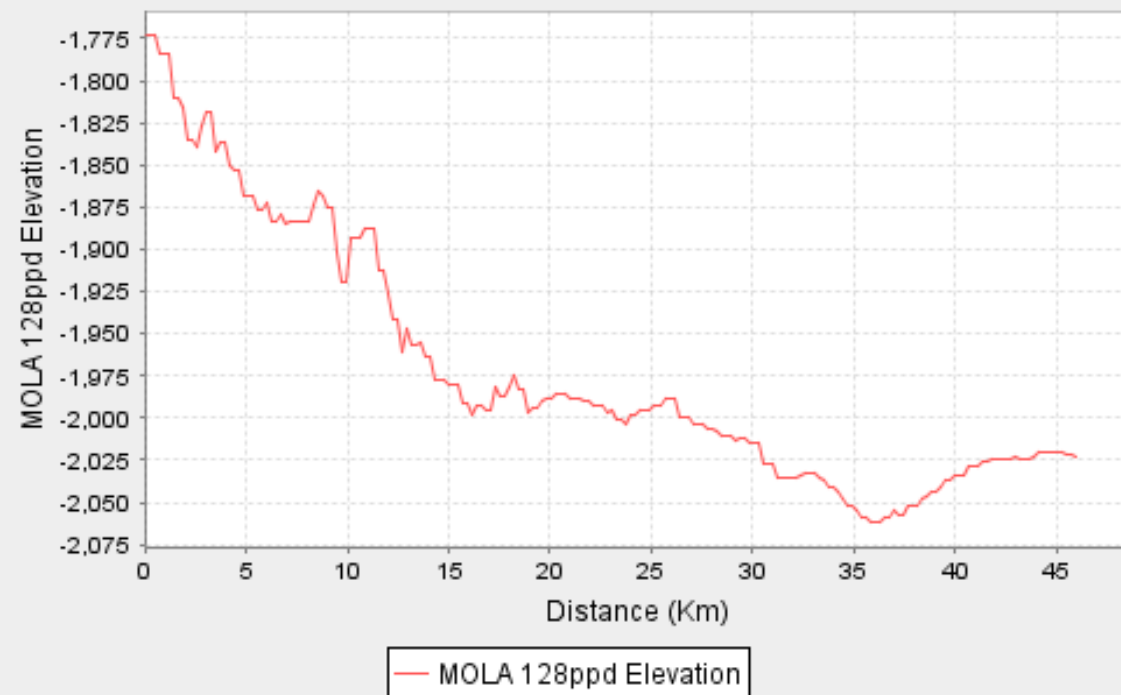
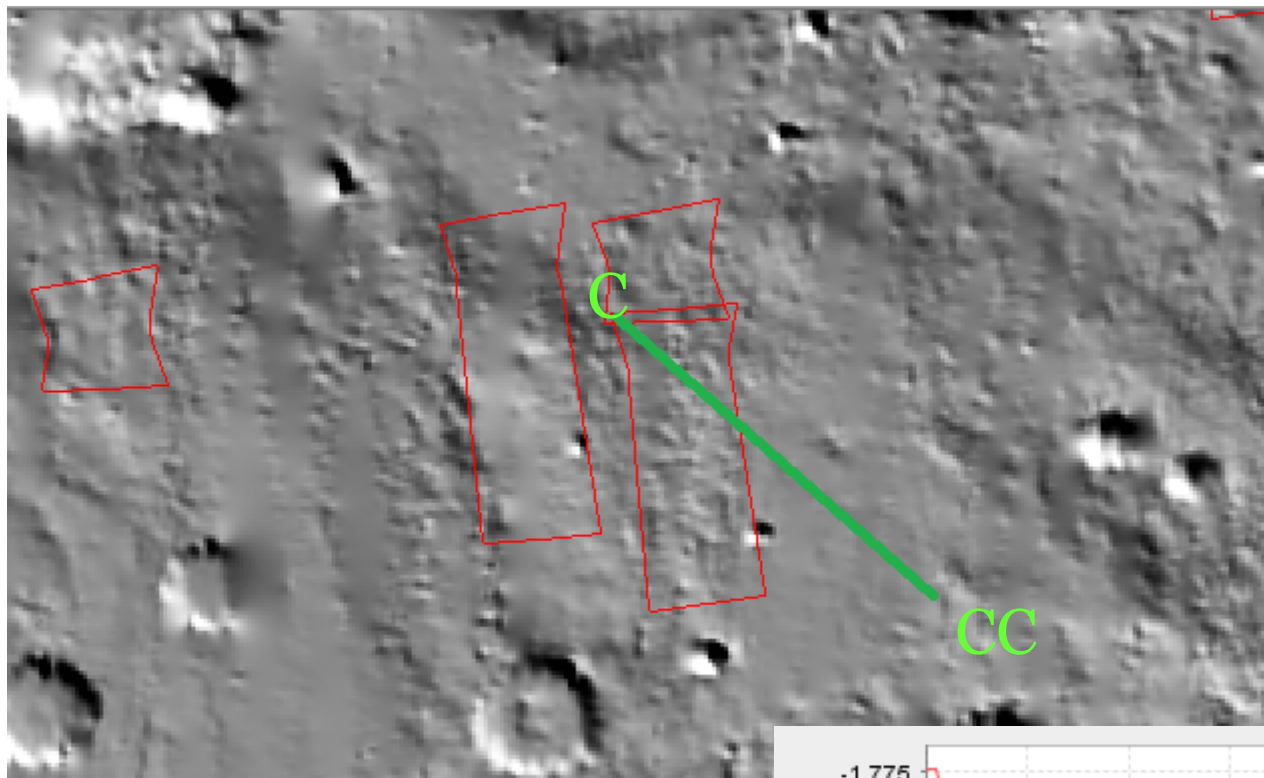




CTX imagery







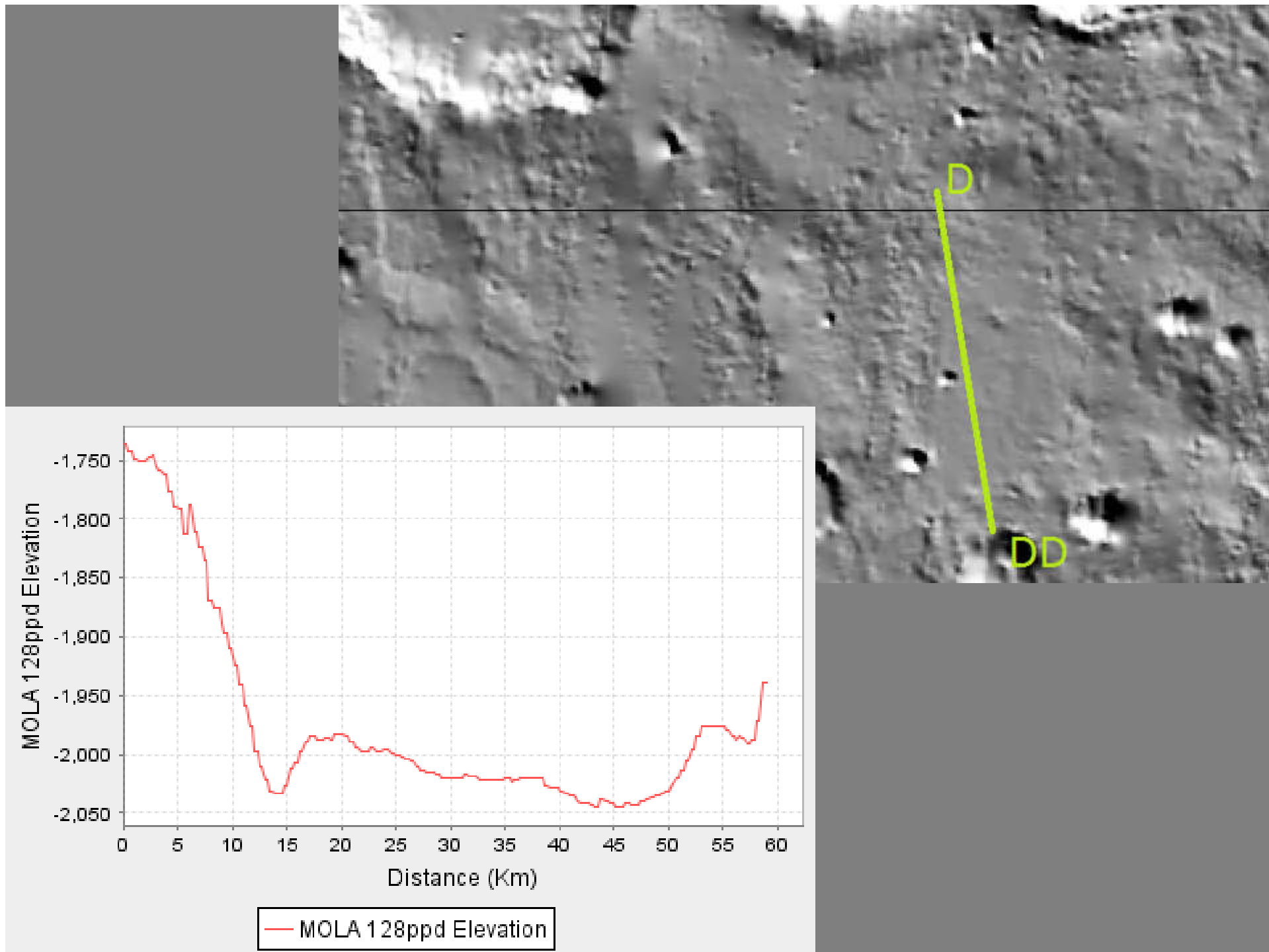


Image NASA / USGS
ESA / DLR / FU Berlin (G. Neukum)

Google earth

Imagery Date: 2/11/2009

lat 19.637965° lon -17.226456° elev -2003 m

Eye alt 74.87 km

18.0 km



Elevation



18.0 km

Image NASA / USGS
ESA / DLR / FU Berlin (G. Neukum)

Google earth

lat 19.634893° lon -17.228097° elev -2003 m

Eye alt 74.87 km

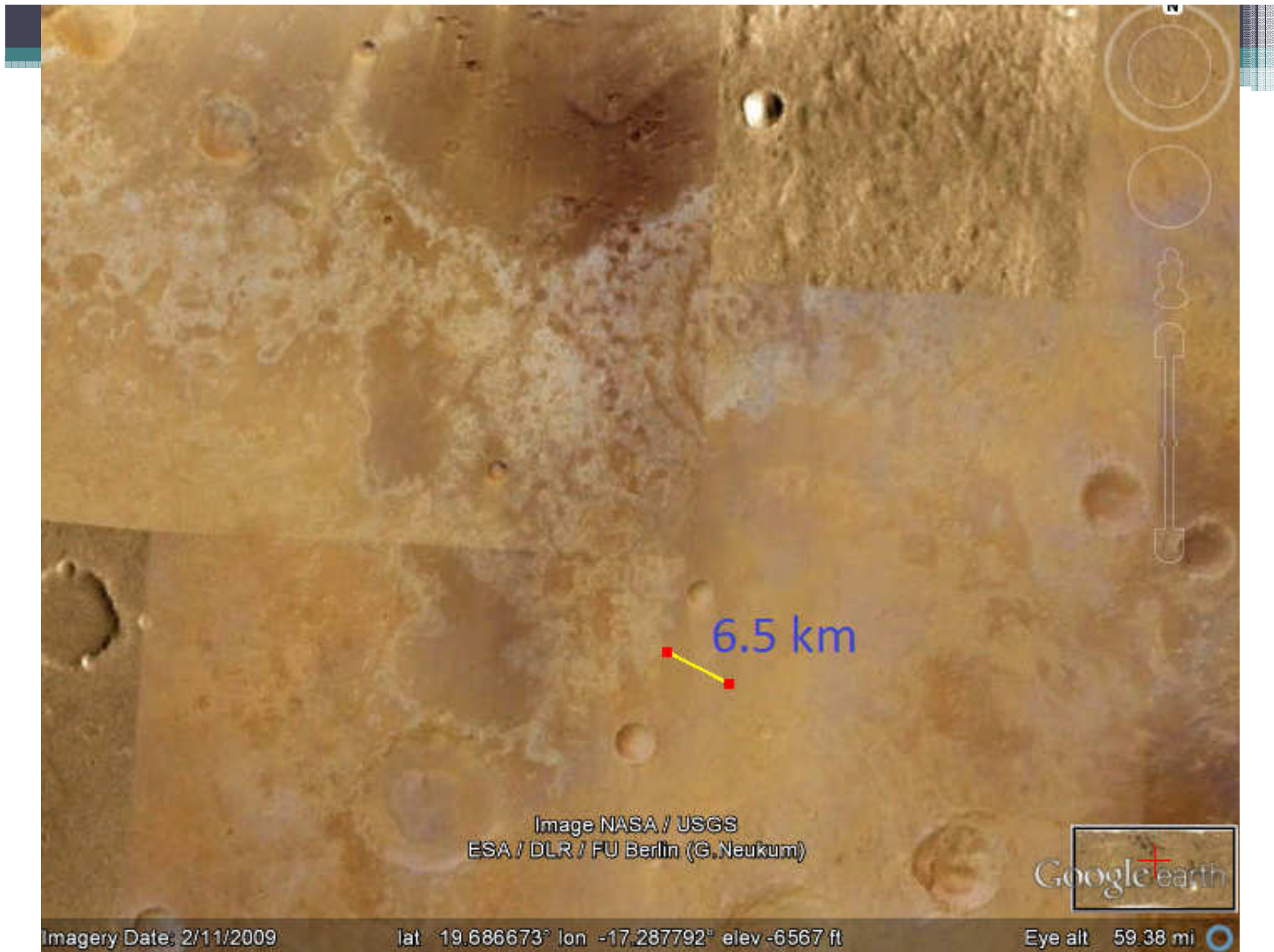


Image NASA / USGS
ESA / DLR / FU Berlin (G. Neukum)



Imagery Date: 2/11/2009

lat 19.686673° lon -17.287792° elev -6567 ft

Eye alt 59.38 mi



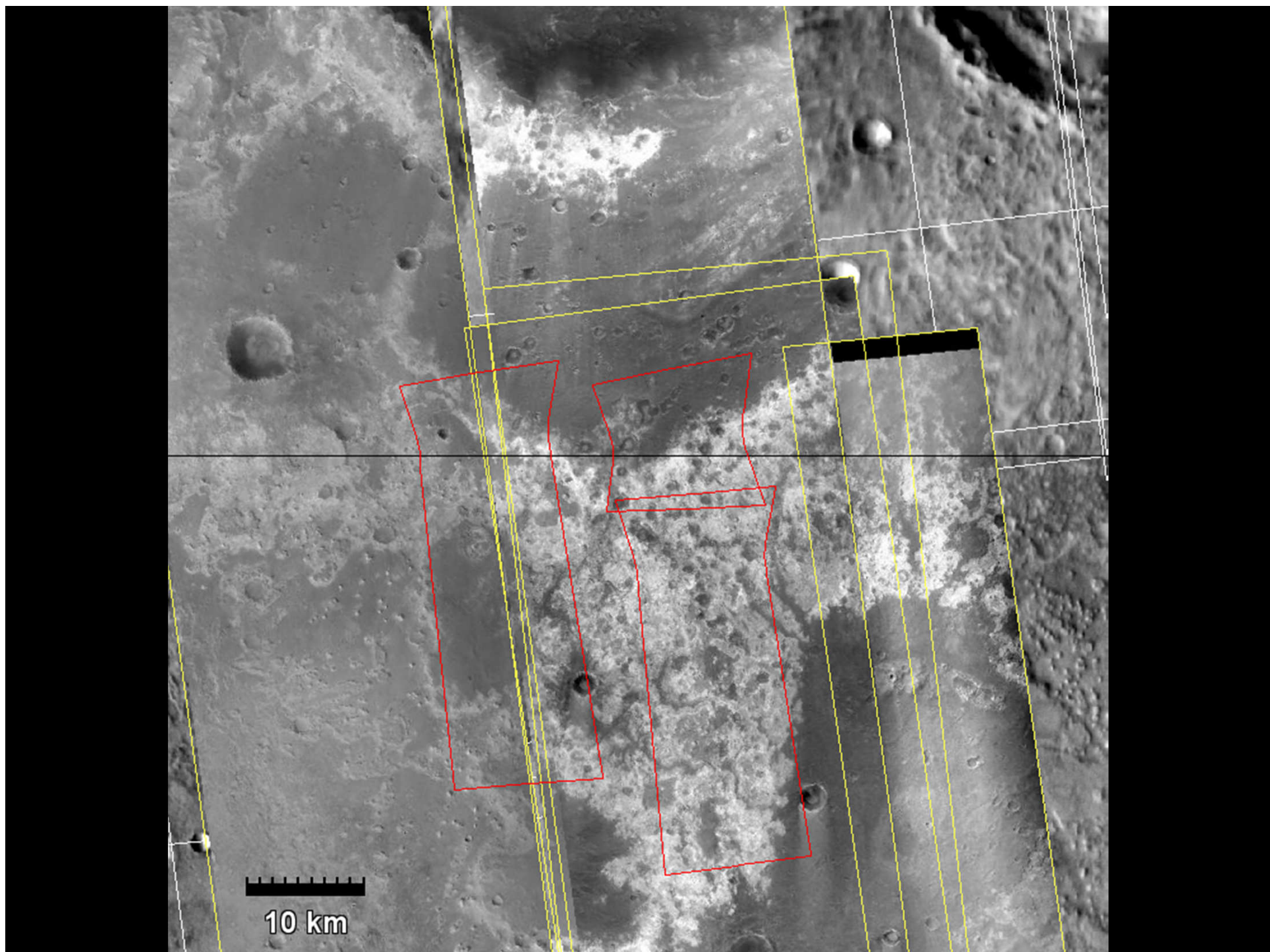
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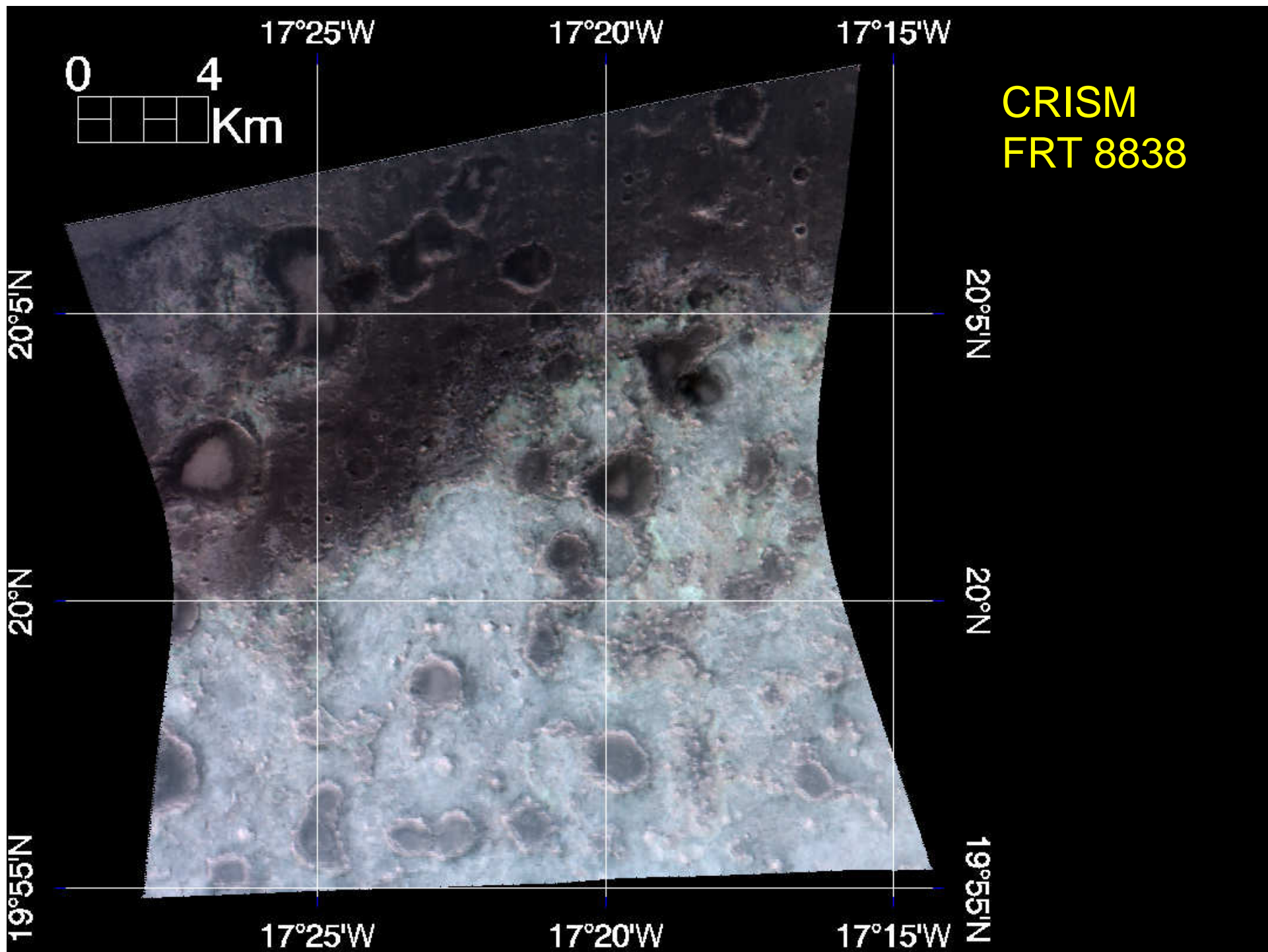


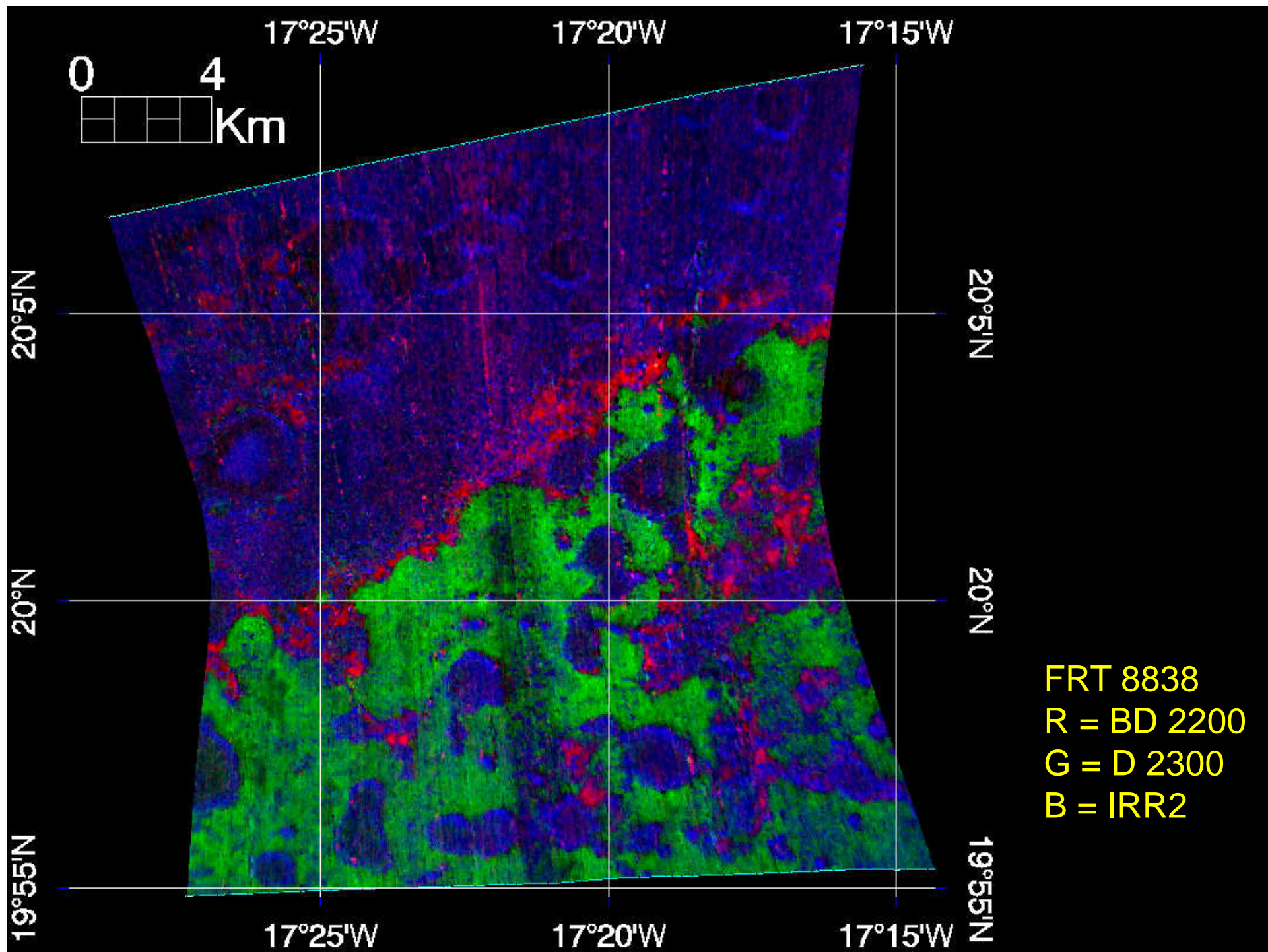
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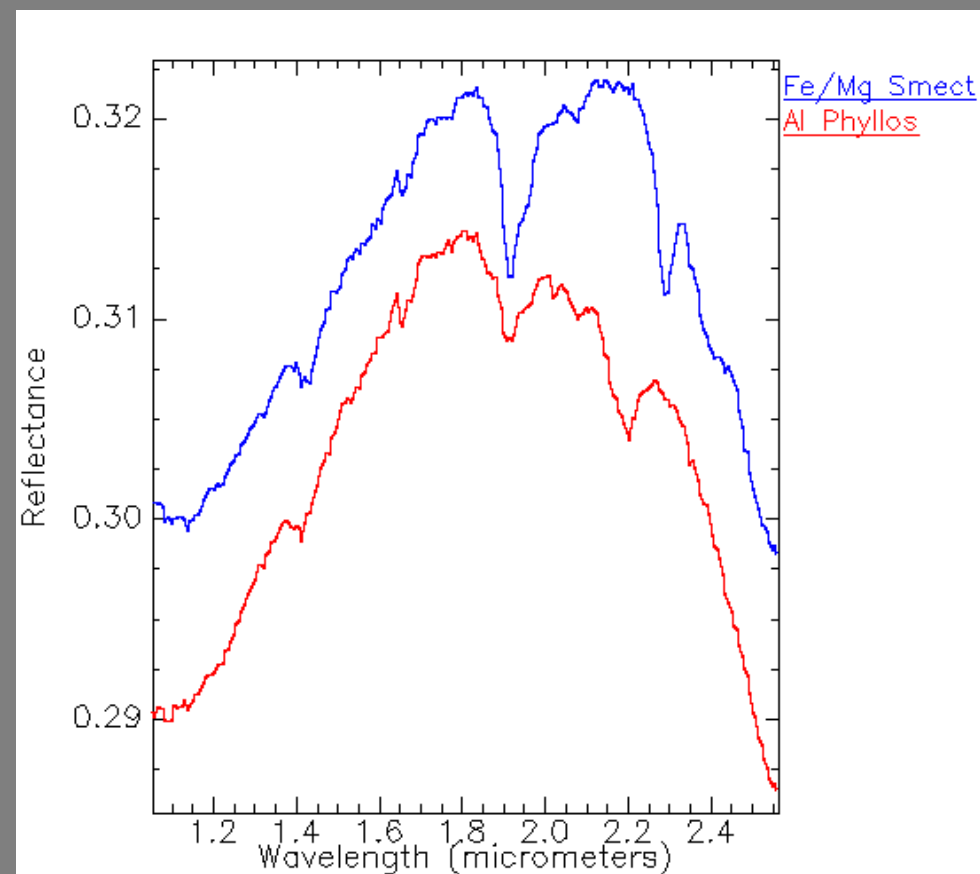
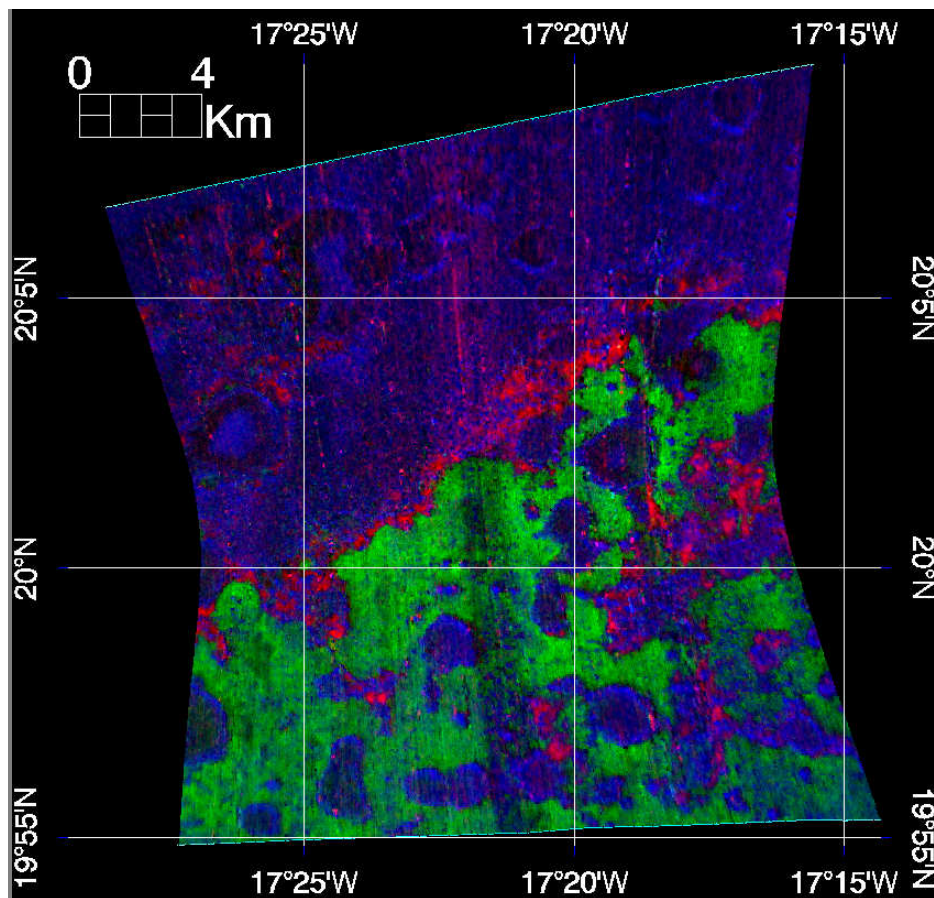
lat 19.369827° lon -17.189878° elev -6587 ft

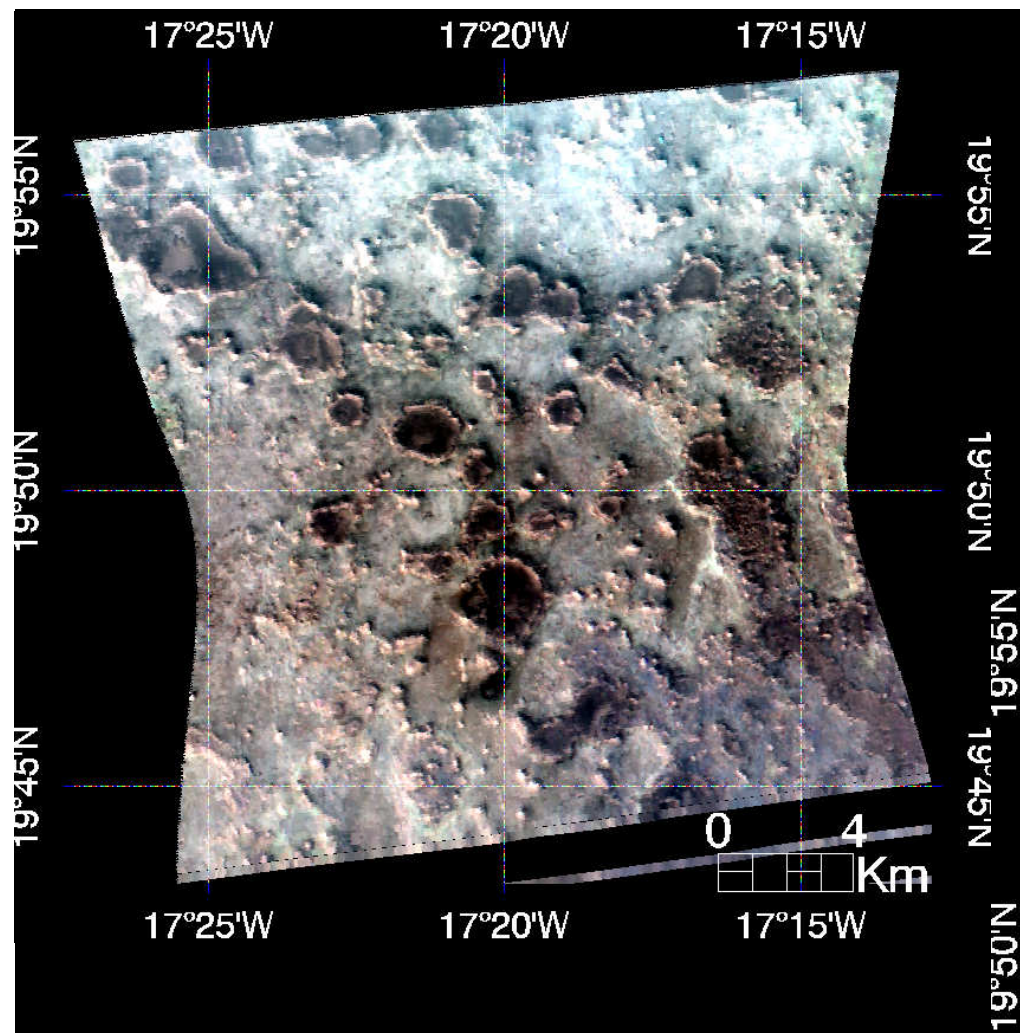
Eye alt 22.49 mi



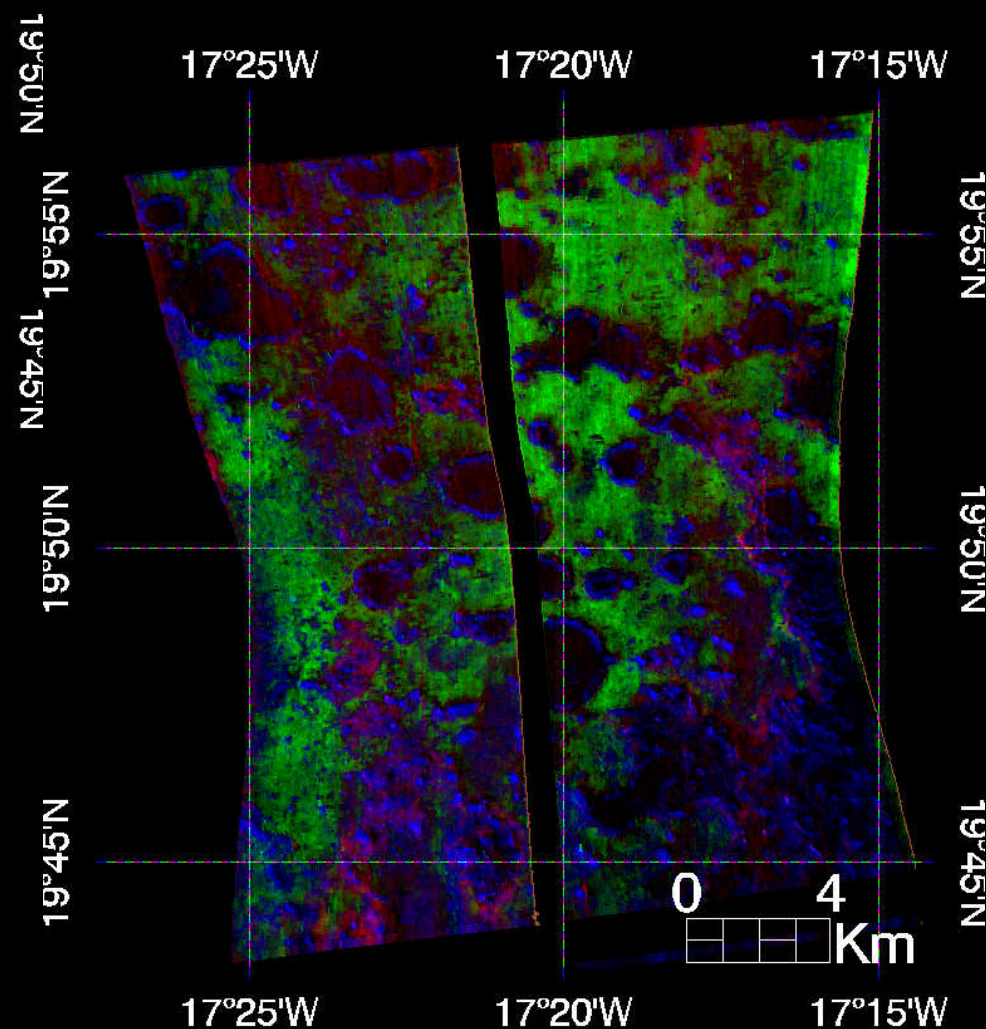


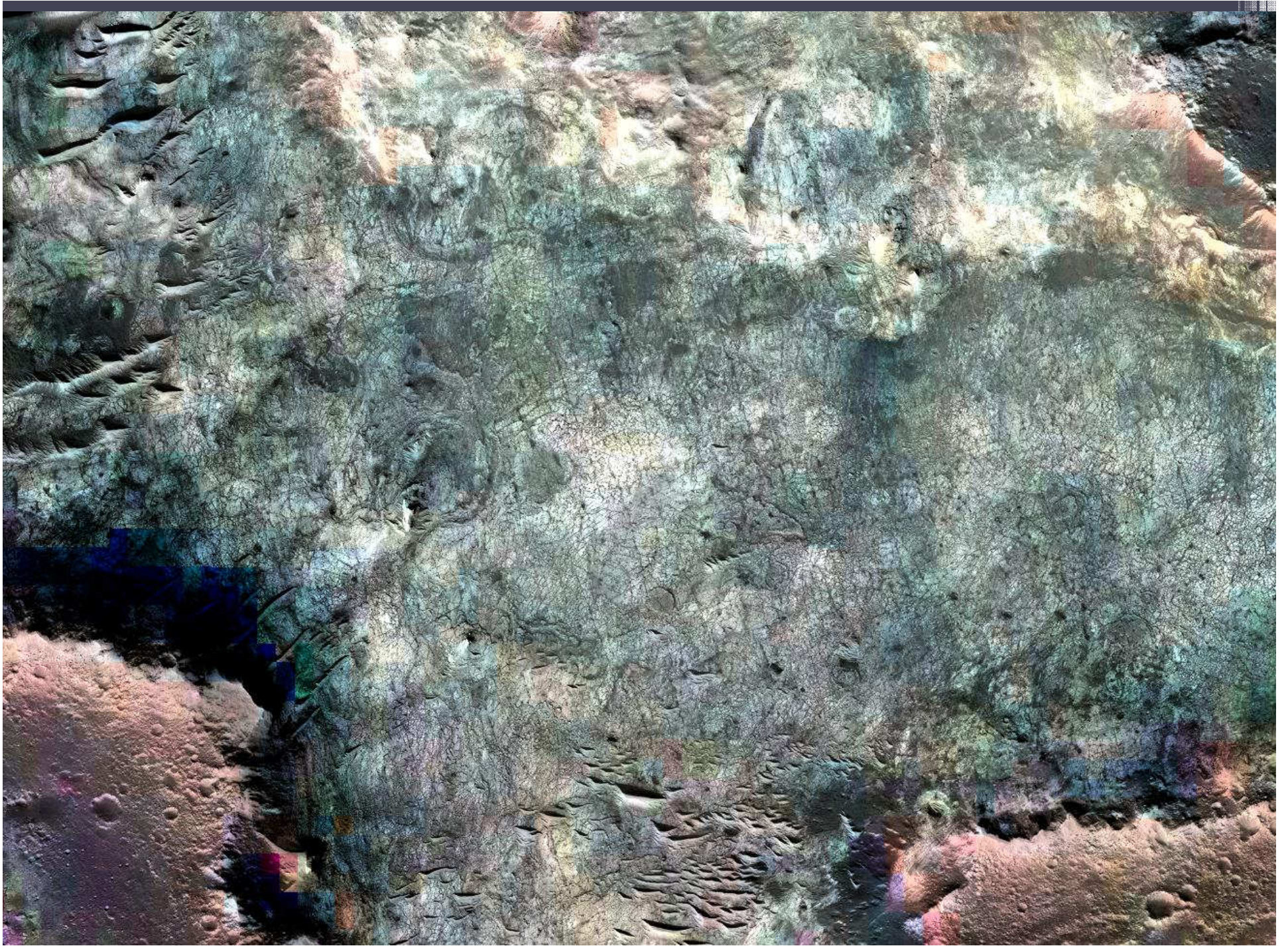


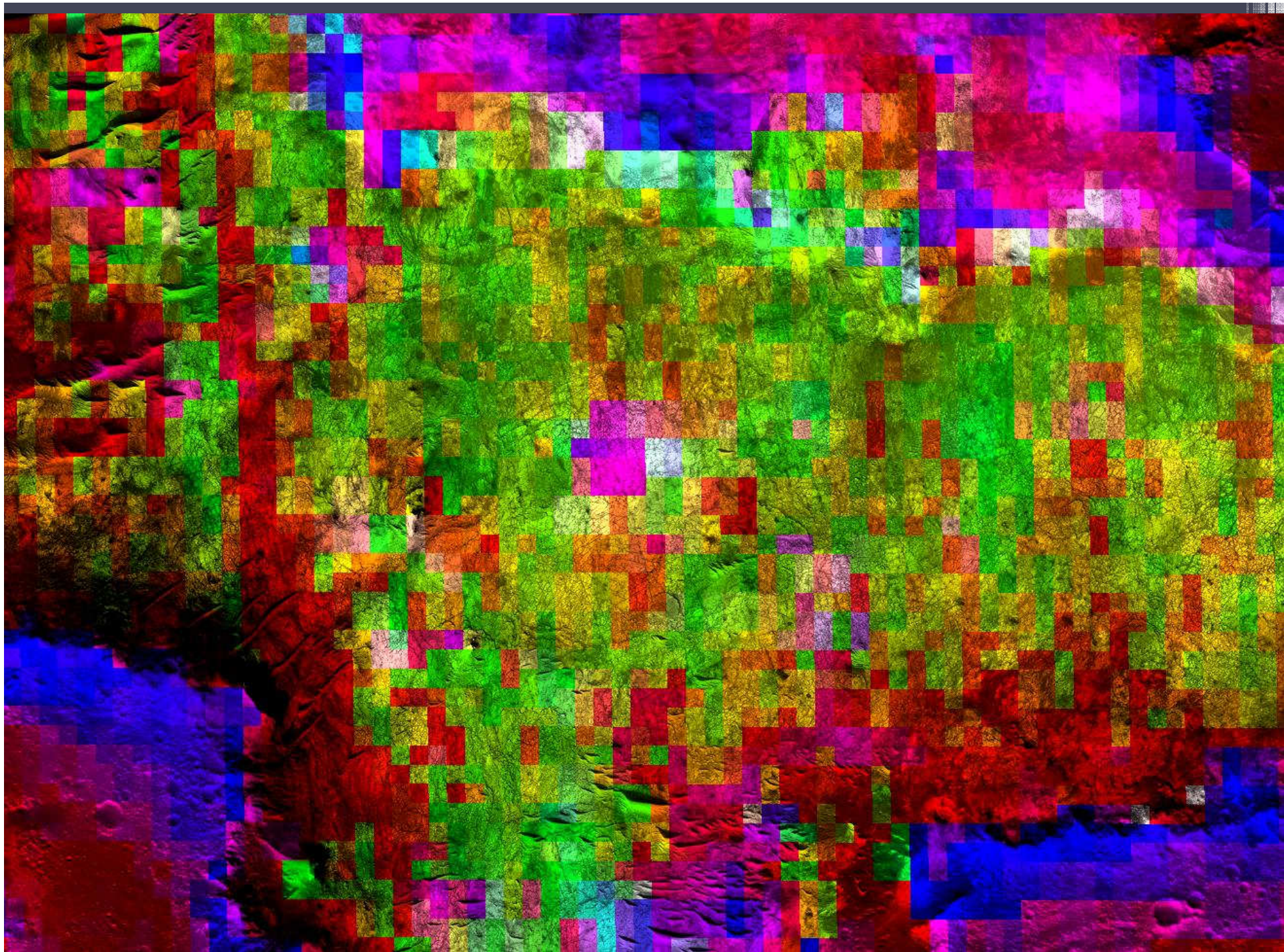




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 R = BD
 2200
 G = D 2300
 B = IRR2

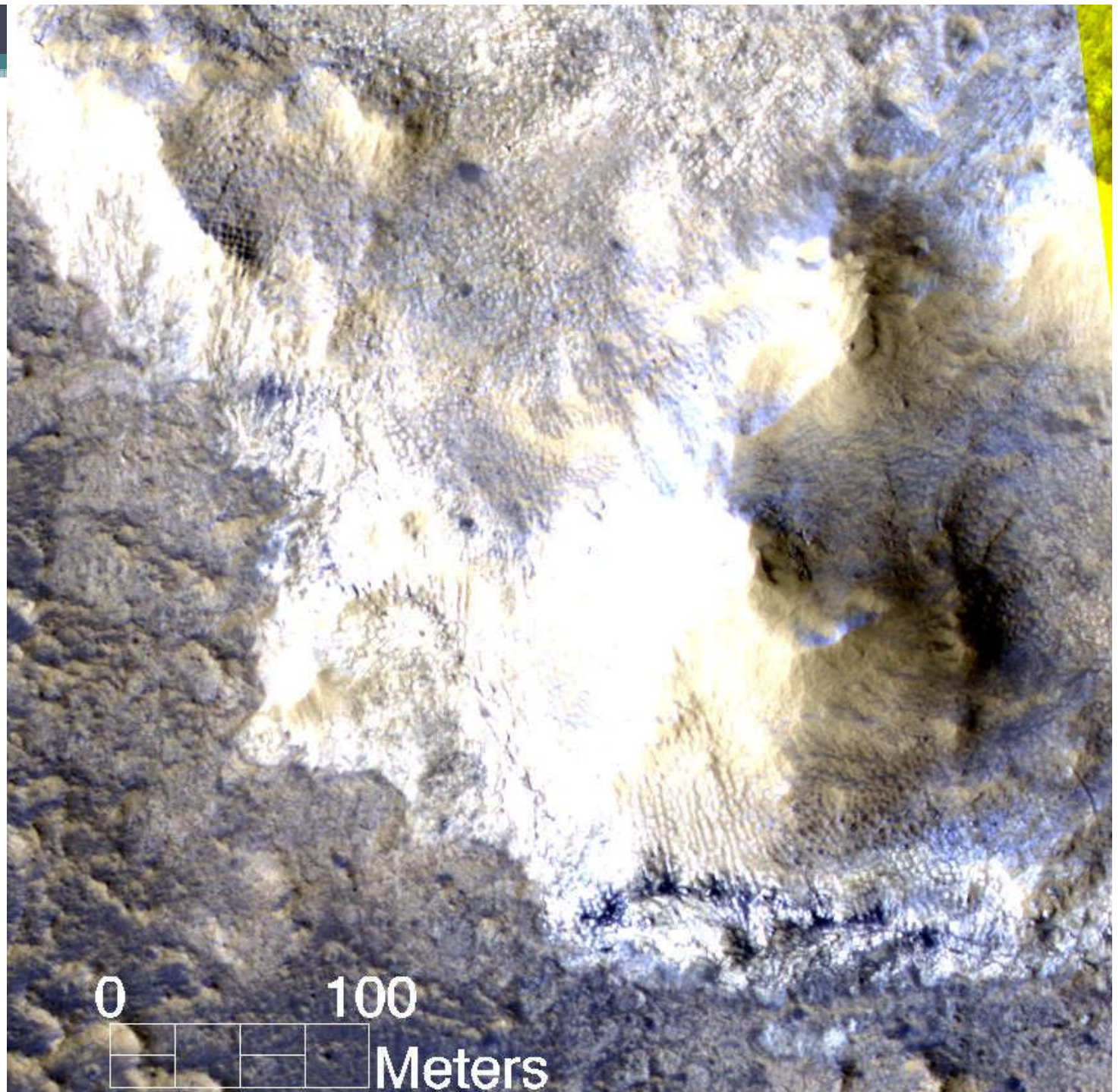


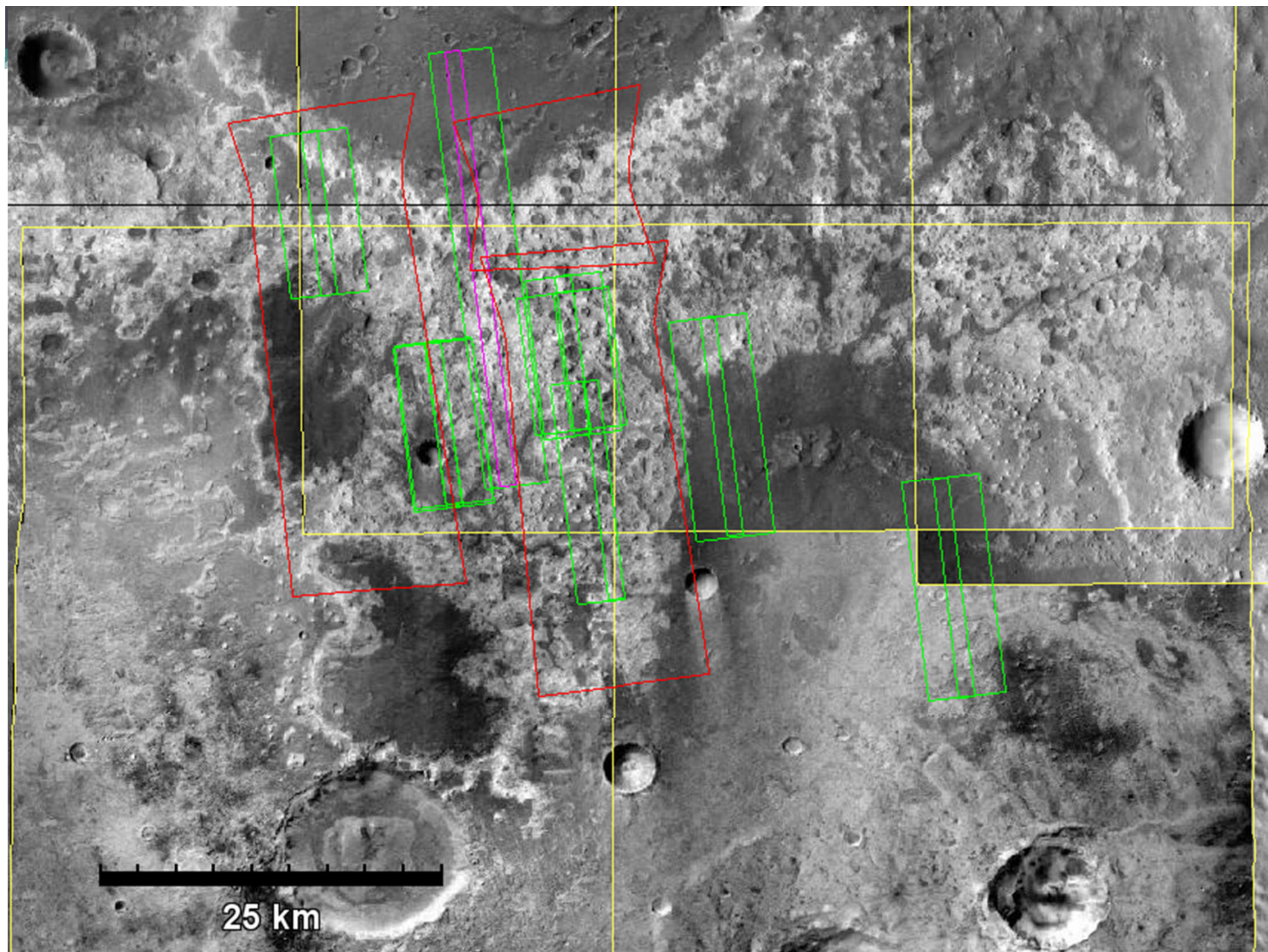




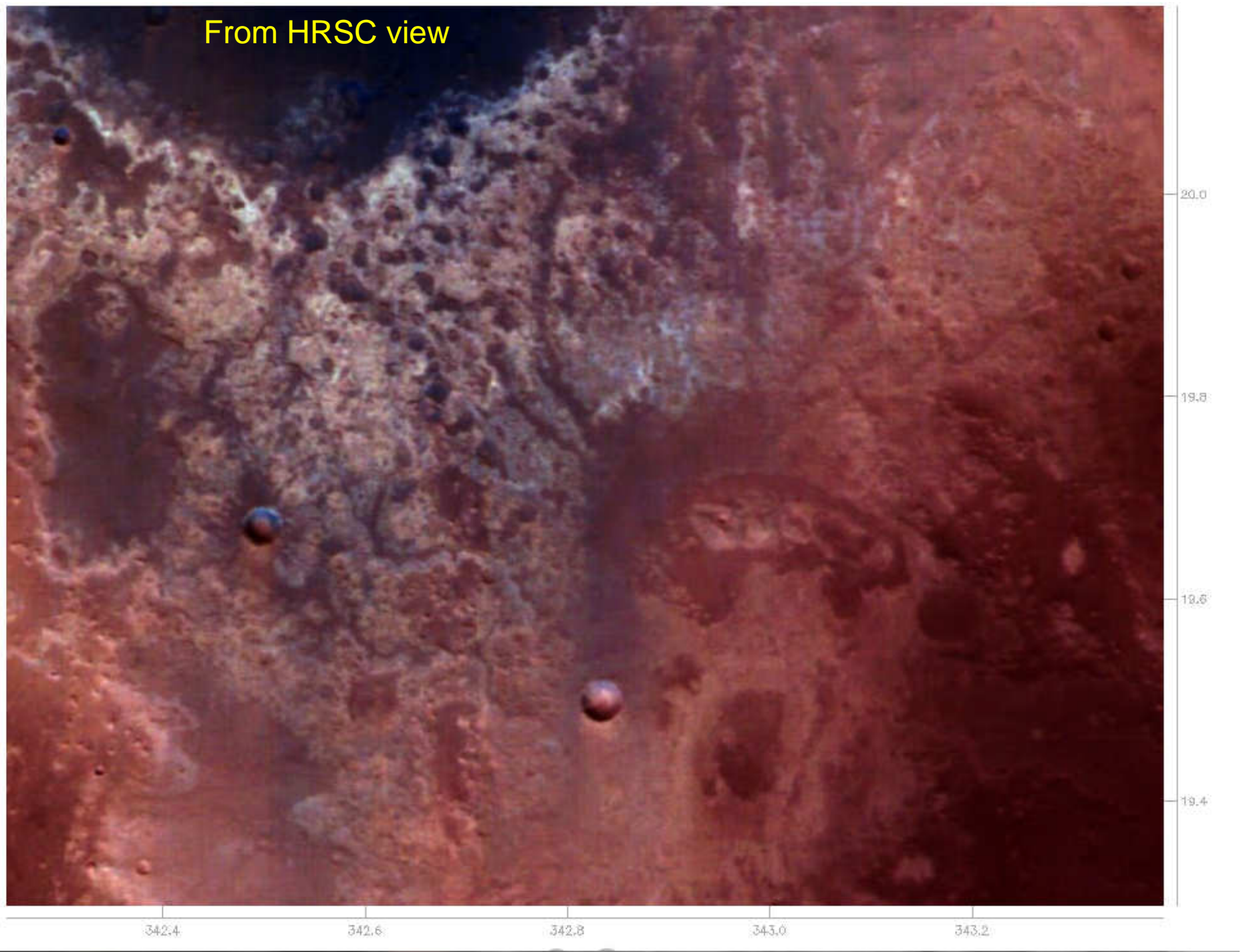
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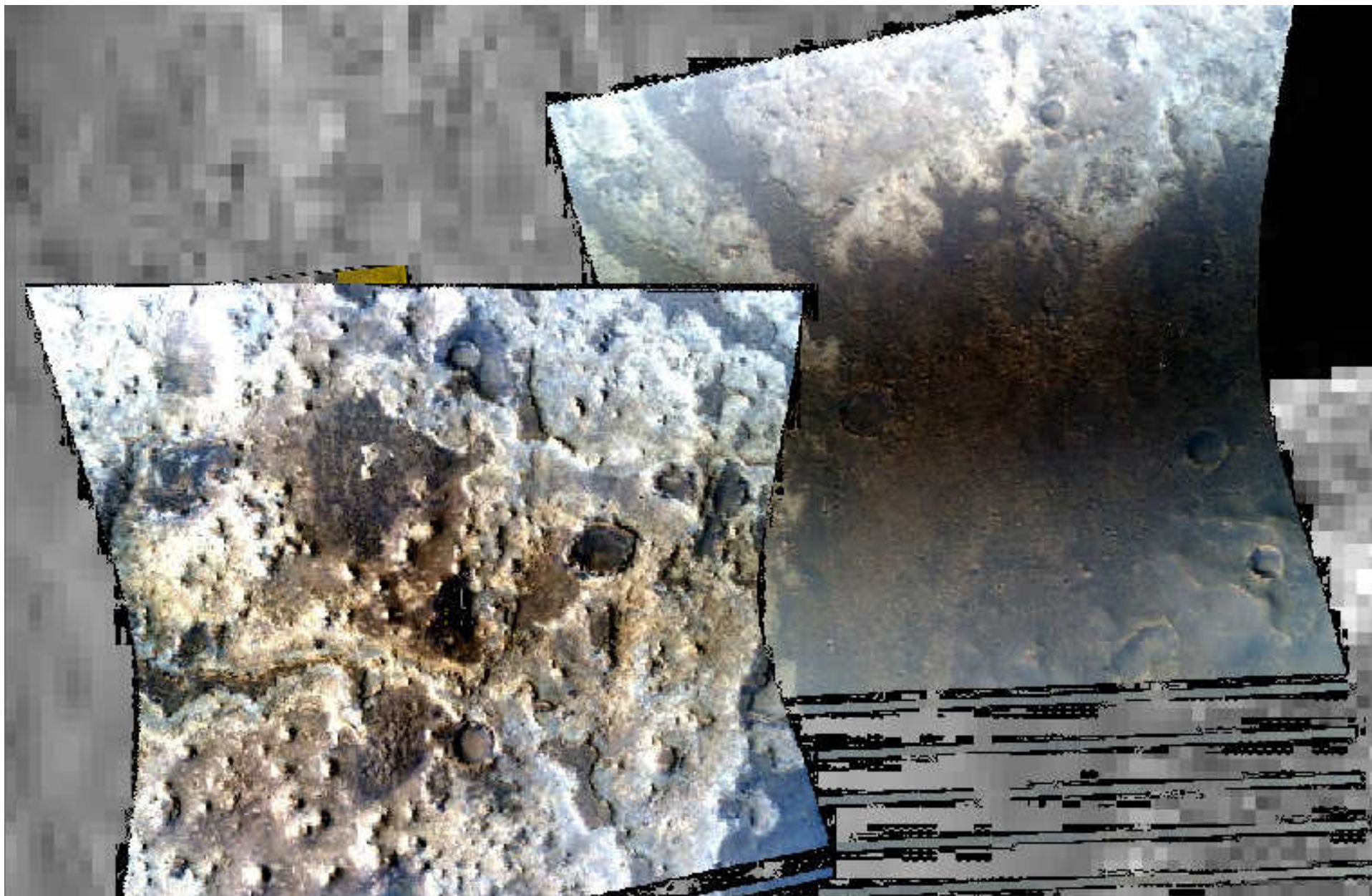
Al phyllosilicates
overlying Fe/Mg
smectites



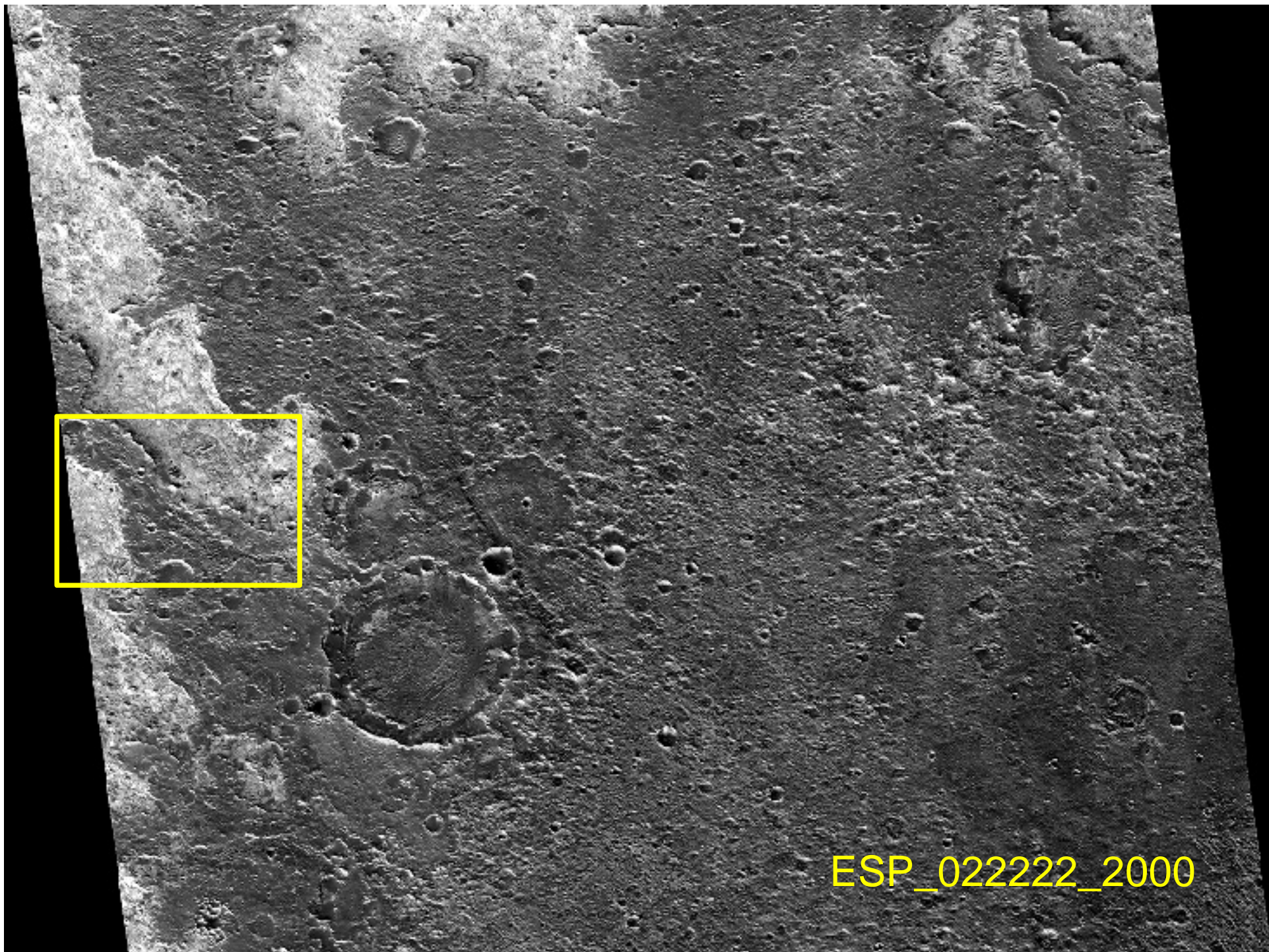


From HRSC view



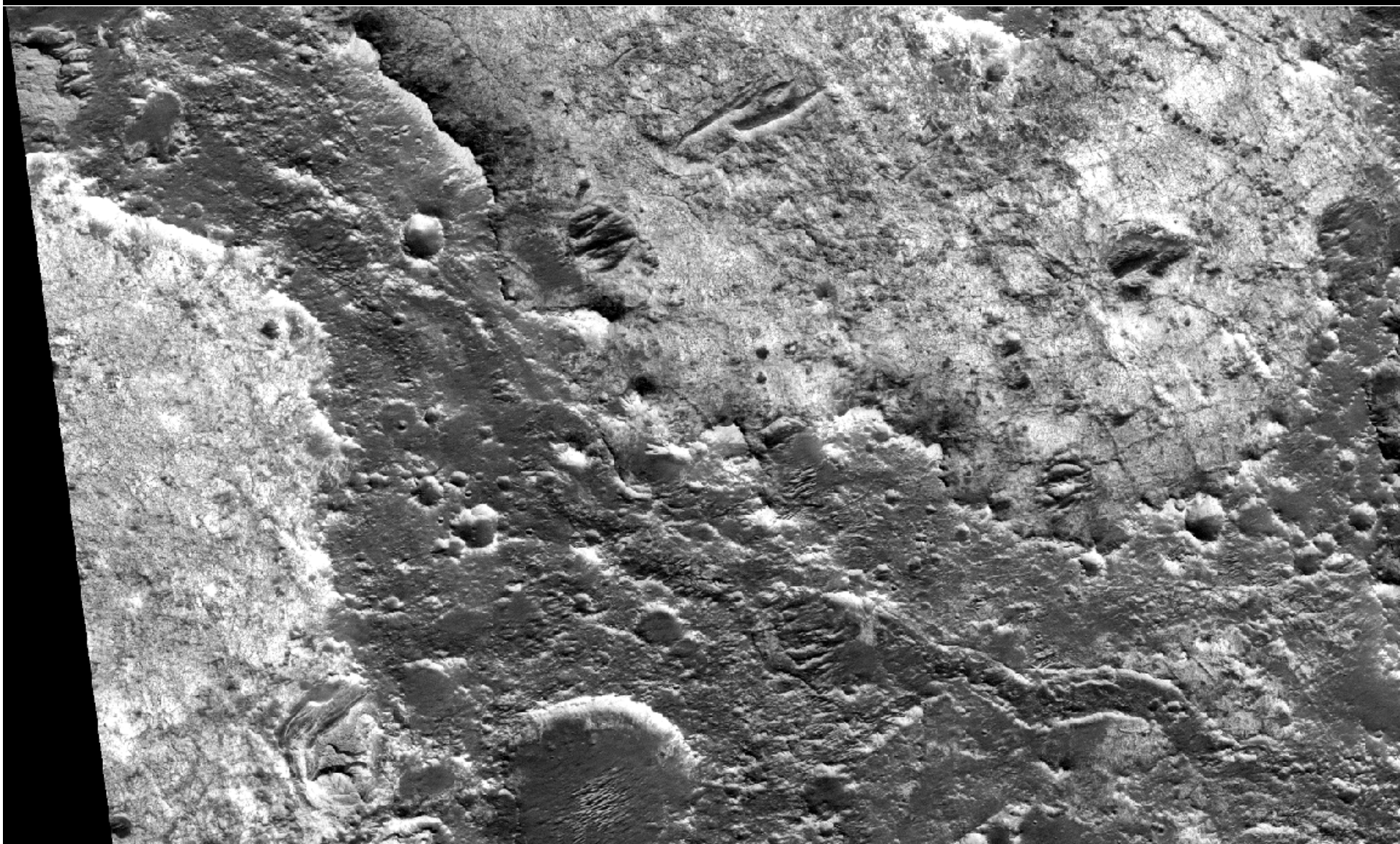


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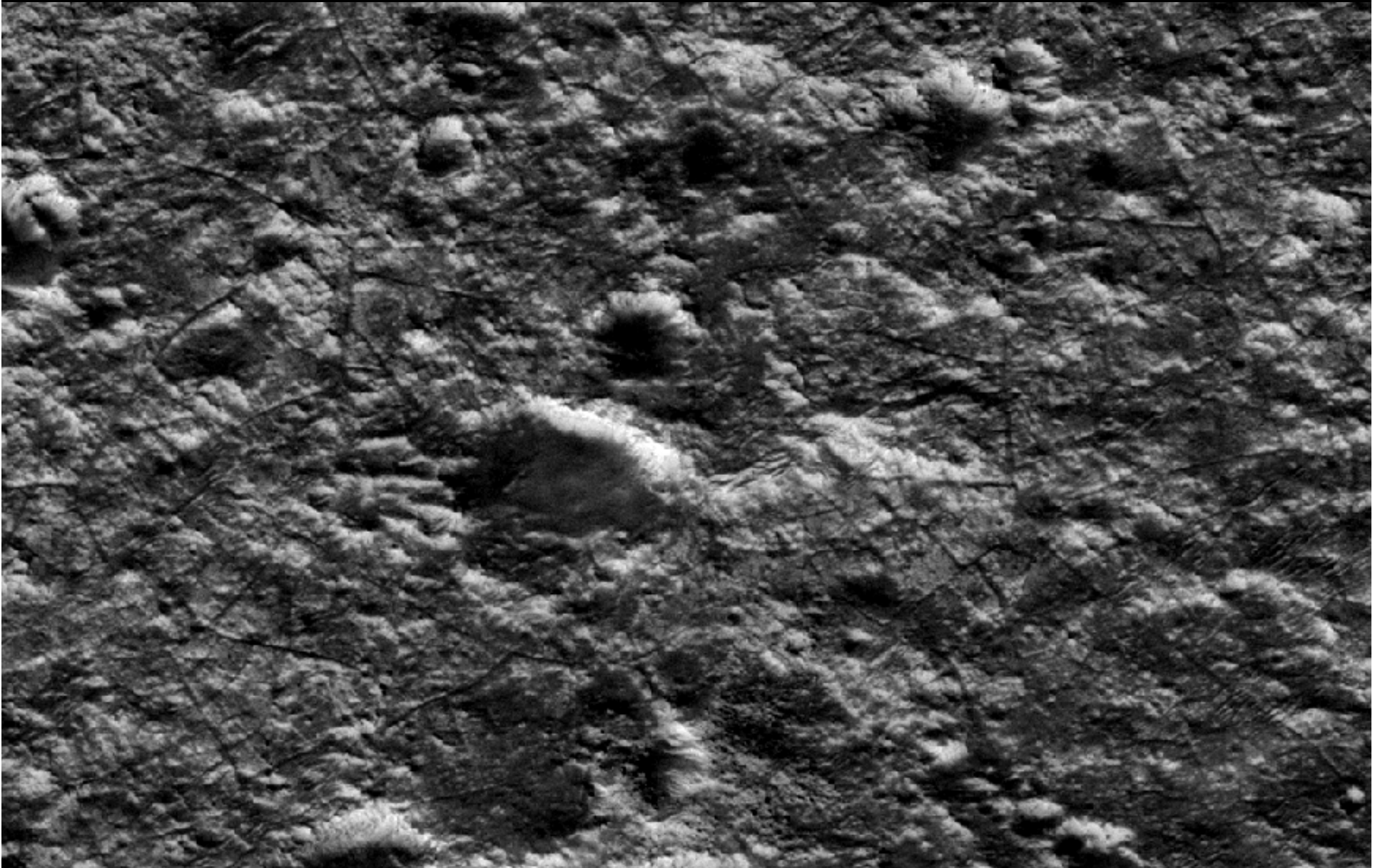
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ESP_022222_2000



Prolonged history of water flow...

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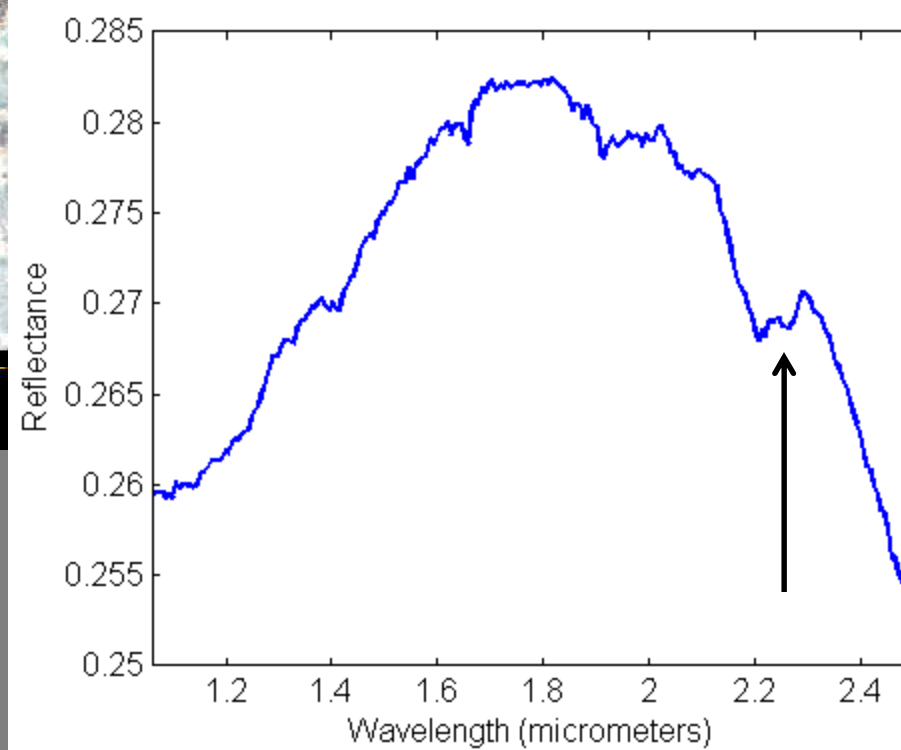
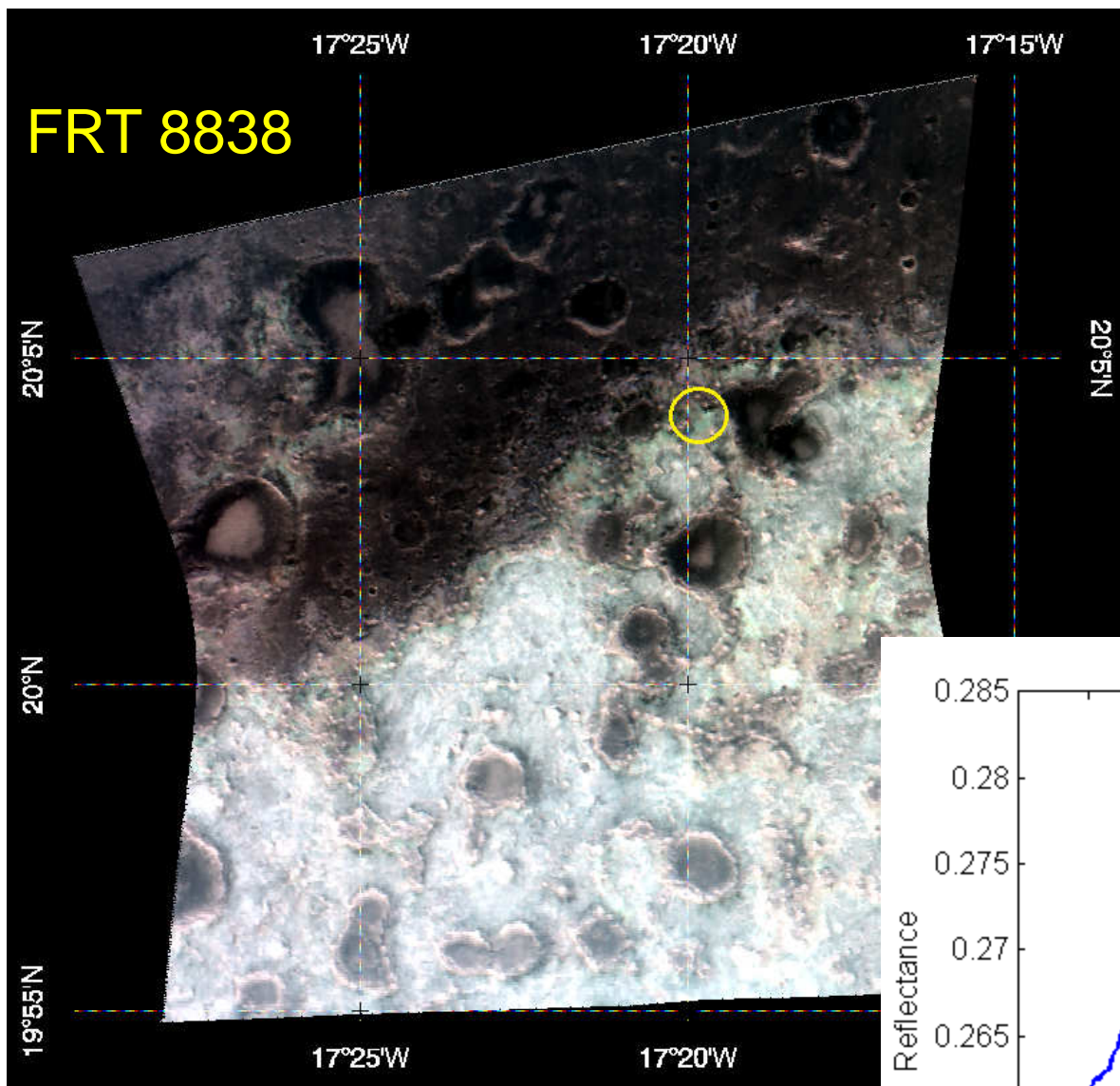


Rectilinear fracture patterns in the dark “mantle”

Sulfates on top of the Al Phyllosilicate unit?

- Recent paper in the *Mars Journal* by Noe Dobrea et al. (2011) pointed out some occurrences of an “acid leaching” component in the upper portions of the Al phyllosilicate unit and some scattered occurrences of jarosite
- Farrand et al. (2009) found a discrete patch of jarosite in an $\sim 3 \times 2$ km ovoidal area in N. Mawrth Vallis
- The jarositic patches on top of the Al phyllosilicate unit are more scattered

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Non-linear mixture modeling of jarositic spectrum

- Applying a *Shkuratov et al. (1999)* derived scattering model to the jarositic spectrum *ala Farrand et al. (2011)*:

Cronstedtite	Halloysite	Montmor 1	Plag 1	Alunite	Jarosite 3	Glass	Ferrihydrite 1	RMS error
0.065	0.0191	0.1107	0.2537	0.0211	0.1283	0.1638	0.1245	0.000711

Conclusions

- The area south of Mawrth Vallis described in this presentation presents a broad expanse of the distinctive Mawrth Vallis stratigraphy in a more southerly latitude allowing for better solar insolation
- This area has exposures of Fe/Mg smectites, Al phyllosilicates, and, apparently, scattered occurrences of jarosite
- Geomorphology of the region includes inverted topography channels indicating a protracted history of aqueous activity
- The channels converge on a depression to the southeast... a possible paleo-pond?

We're ready to go...

